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**From:** Scheckel, Kirk [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=5377B49F9707432EAB7B613986054A78-SCHECKEL, KIRK]  
**Sent:** 3/27/2019 12:36:07 PM  
**To:** Dunlap, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=591eb15a268249dda0c05a7451f765c3-Dunlap, Dav]  
**Subject:** It was nice to meet you!  
**Attachments:** 2004\_Ryanetal\_EST.pdf; 2018\_Bradhametal\_EST.pdf; 2013\_Schecketal\_JTEHptB.pdf  
**Flag:** Follow up

Hello David,

Thanks for your inquisitive questions and interest in the work ORD is doing in Cincinnati. As you can imagine, it is difficult to simmer 18 years of research from over 170 publications into a 5-minute overview. Just for your information regarding long-term stability of soil treatments, attached are two papers that examine the bioavailability of soil samples from a phosphate (co-amendments included compost and an iron waste product) amendment study. The 2004 paper was developed as part of my postdoc work when started with the Agency and the 2018 paper highlights samples collected about 20 years after the initial testing at the same site showing that the protectiveness improves with age, like a great bourbon.

For metals in soils, pH is the master variable that we need to control. The forms or species of metals in soils are govern by pH and the concentration of the metal. There are other factors to monitor, but pH must be the first. The 2013 paper attached gives a nice overview of in-situ remediation of Pb utilizing phosphate and highlights several concerns of how this is not a trivial effort. There are a number of commercial enterprises that promote phosphate treatment, but do not conduct any follow up to verify reduction in risk.

The new remediation effort we are pursuing actually came to us from Region 8 where an RPM was completely stumped why some soils he encountered with elevated Pb levels were demonstrating such low (<5%) bioavailability. My group examined the samples for speciation and identified the plumbojarosite mineral to explain the significantly low bioavailability. We then went into the literature to find synthesis recipes to make plumbojarosite, which dated back over 40 years, and attempted preliminary studies in the lab. To our surprise, we are converted all other forms of Pb in soils to plumbojarosite with bioavailability dropping in many cases to <1% under our controlled parameters. The process involves a heated iron sulfate solution added to soil, and can sequester both Pb and As to very low risk levels. The iron solution added is exactly the same compound added to food to iron fortify it, so it is very environmentally safe. We're quite excited to be conducting this research.

It was a pleasure to meet you as well as Administrator Wheeler. I hope the rest of your week is peaceful.

Regards,  
Kirk

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